Chapter XI
Handling RFID Data Using a Data-on-Tag Approach

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ABSTRACT

RFID tags can store more data and can update this data through local processing. This is in contrast to the EPC global standard of data-on-network. In order to illustrate this concept of data-on-tag a single case study of a smart laundry bin is undertaken. The laundry bin is able to process the count of soiled linen tagged with RFID at the time of Pickup. Thus the processing is taking place at the time of data capture and does not depend on the central database with expensive middleware. Further, data modelling for data stored at different objects like linen, laundry bin and pickup PDA is undertaken. Issues and solutions for this are discussed at the end.

1. INTRODUCTION

Mark Weiser (Weiser, 1993) envisioned a ubiquitous computing environment for the future where technology is omnipresent in the environment and 'invisible' to the user. This is also referred to as pervasive computing. The computing devices are small and well integrated into the environment to provide useful information where required at any time. Radio Frequency Identification (RFID) is one such promising technology in the field of pervasive computing. It is more advantageous than barcode technology having no line of sight for reading tags, can read several tags simultaneously, store more data on the tag and data on the tag can be manipulated (Haas & Miller, 1997; Hardgrave, Armstrong, & Riemenschneider, 2007). The cost of implementing RFID is also reducing, making realisation of Return of Investment (ROI) in commercial deployment more achievable.

Most commercial applications currently use passive tags and centralised data storage models

(Diekmann, Melski, & Schumann, 2007). With hardware costs falling, it is possible to think of accepting RFID tags with storage and processing capabilities. With data storage and manipulation capabilities in RFID tag, representing physical objects becomes a means of decentralised data storage (Melski, Thoroe, Caus, & Schumann, 2007). This was earlier envisioned (Gray, 2004) where smart objects are embedded with smart dust and local processing can take place at this level. Thus for some specific applications data intelligence is moving towards the periphery of a network and not relying on a central database. Hence it is important to understand how much data can be stored in an RFID tag and how it can be processed. Further, the data needs to be structured and modelled to be read and processed across the enterprise.

In order to illustrate the concept of storing more data on RFID tag and processing it, a case study of a smart laundry bin for a hospital laundry is considered. The bin should be smart enough to count the soiled linen in the bin. RFID tags are attached to linen and contain details of that linen. The bin is only not just smart enough to recognise the linen and count them but also able to write some updated data into the linen tag. Thus all data pertaining to the linen is stored in its tag close to the physical object. It does not depend on a central database or middleware software for any meaningful information from this tag data. Thus local processing can take place close to the vicinity of the objects.

In order to understand the required technology and infrastructure for the smart laundry bin, a review of the academic literature is undertaken. The main purpose is to understand the background of different RFID tags, the available standard architecture to integrate RFID data into the enterprise and whether there are any available data modelling schema and manipulation tools available.

Thus, the research focuses on finding the solution for the following question:

How can data from RFID tags be better managed in a data-on-tag approach?

First the literature will be considered. Then, the knowledge gained will be applied to a practical single case study situation. Finally, some discussion and findings will be presented to analyse the research question.

2. LITERATURE REVIEW

2.1 Background

Although barcode technology has been widely used for applications such as Supply Chain Management (SCM) to identify and track products, RFID has many advantages. First of all, a barcode has a unique identity for all items of a particular type. For example all books of the same title and author have the same barcode. However, RFID identifies each item using a unique identity. Thus each book copy has a unique product number stored on a RFID tag. Such unique identification further helps in tracing a particular book in the SCM or in an asset tracking system such as for a public library.

Secondly, barcodes need a line of sight between the label and the scanner device. The result is that using barcode technology, each book for example, needs to be handled individually and in close proximity to the scanner in order to be able to read each barcode. This process of individual handling involves expensive labour processes in the supply chain. RFID tags on the other hand are automatically scanned by interrogators from a wider range (depending on the generation of tag and reader) and multiple tags can be read in very quick succession.

In this paper we consider a case study where laundry inventory control management works on a system of five sets of linen for each bed serviced. No counting of linen is undertaken. However, stock control problems occur when linen is lost in the system and there are not enough sets of linen to service each bed in the system. Counting the linen at the point of collection is not an option